9th Class 2017		
Chemistry	Group-I	Paper-I
Time: 1.45 Hours	(Subjective Type)	Marks: 48

(Part-I)

Q.2. Write short answers to any Five (5) questions: 10

(i) Write two applications of nuclear chemistry.

Ans Two applications of nuclear chemistry are:

1. Medical Treatment (Radiotherapy)
2. Preservation of Food

(ii) Define free radicals. Give two examples also.

Ans Free radicals are atoms or group of atoms possessing odd number of (unpaired) electrons. It is represented by putting a dot over the symbol of an element, e.g., $H^{\bullet}$, $Cl^{\bullet}$, $H_3C^{\bullet}$.

(iii) Who discovered an electron and proton?

Ans J.J. Thomson discovered electrons while Goldstein discovered protons.

(iv) What is maximum capacity of a shell?

Ans The maximum capacity of a shell to accommodate the electrons is as follows:

(i) K shell can accommodate 2 electrons.
(ii) L shell can accommodate 8 electrons.
(iii) M shell can accommodate 18 electrons.
(iv) N shell can accommodate 32 electrons.

(v) What are the defects of Rutherford's atomic model?

Ans It had following defects:

1. According to classical theory, electrons being the charged particles should release or emit energy continuously and they should ultimately fall into the nucleus.

2. If the electrons emit energy continuously, they should form a continuous spectrum but, in fact, line spectrum was observed.

(vi) Define atomic radius. Give an example also.

Ans The half of the distance between the nuclei of the two bonded atoms is referred as the atomic radius of the atom. For example, the distance between the nuclei of two carbon atoms in its elemental form is 154 pm, it means its half 77 pm is radius of carbon atom.

(vii) Why the elements are called s and p block elements?

Ans Elements of group 1 and 2 have valence electrons in 's' subshell. Therefore, they are referred as s-block elements. Elements of group 13 to 18 have their valence electrons in 'p' subshell. Therefore, they referred as p-block elements.

(viii) What do you mean by groups and periods in the periodic table?

Ans The horizontal rows of elements in the periodic table are called periods. While the vertical columns in the periodic table are called groups.

Q.3. Write short answers to any FIVE (5) questions: 10

(i) Why are noble gases not reactive?

Ans The noble gases have 2 or 8 electrons in their valence shells. It means all the noble gases have their valence shells completely filled. Their atoms do not have vacant space in their valence shell to accommodate extra electrons. Therefore, noble gases do not gain, lose or share electrons. That is why they are non-reactive.

(ii) Why do atoms react?

Ans Every atom has a natural tendency to have 2 or 8 electrons in its valence shell so that they can be stable. Atoms react with each other to fulfil this quantity of electrons.

(iii) Why a covalent bond becomes polar?

Ans If the covalent bond is formed between two different types of atoms (hetro-atoms), then the bond pair of electrons will not be attracted equally by the bonded atoms. One of the atoms will attract the bond pair of electrons more strongly than the other one. This atom (element) will be called as more electronegative.

When there is difference of electro-negativity between two covalently bonded atoms, there will be unequal attraction for the bond pair of electrons between such atoms. It will result in the formation of polar covalent bond.

(iv) Define hydrogen bonding.

Ans Partially positively hydrogen of one molecule attracts and forms a bond with the partially negatively charged atom of the other molecule, the bonding is called hydrogen bonding.

(v) What is meant by diffusion of gases?

Ans Diffusion is defined as spontaneous mixing up of molecules by random motion and collision to form a homogeneous mixture. Diffusion depends upon the molecular mass of gases. Lighter gases diffuse more rapidly than heavier ones.

(vi) State Charles law of gases.

Ans French scientist J. Charles, in 1787, presented his law that states "the volume of a given mass of a gas is directly proportional to the absolute temperature if the pressure is kept constant."

Mathematically, it is represented as:

Volume $\propto$ Temperature

$$V \propto T$$

or $V = kT$ or $\frac{V}{T} = k$

(vii) Define amorphous solids with examples.

Ans **Amorphous solids:**

Amorphous means shapeless. In these solids, th particles are not arranged in a regular manner. Moreover they do not have sharp melting points *e.g.*, rubber, glass etc.

(viii) In which form sulphur exists at 100°C?

Ans At 100°C, sulphur exists in the monoclinic form.

Q.4. Write short answers to any FIVE (5) questions:

(i) Define aqueous solution. Give one example.

Ans The solution, which is formed by dissolving substance in water is called aqueous solution. In aqueou solutions, water is always present in greater amount an termed as solvent. For example, sugar in water and tabl salt in water.

(ii) What is suspension?

Ans Suspension is a heterogeneous mixture undissolved particles in a given medium.

(iii) What is redox reaction? Give example.

Ans A chemical reaction in which the oxidation an reduction processes are involved is called oxidation reduction or redox reaction. For example,

$$Zn_{(s)} + 2H^{+}_{(aq)} \longrightarrow Zn^{2}_{(aq)} + H_{2(g)}$$

(iv) What are non-electrolytes? Give one example.

Ans The substances, which do not ionize in the aqueous solutions and do not allow the current to pas through their solutions, are called non-electrolytes. Fo example, sugar solution and benzene are non-electrolytes

(v) Define galvanizing process.

Ans The process of coating a thin layer of zinc on iron called galvanizing.

(vi) Write importance of non-metals.

Ans The importance of non-metals is as follows:

1. Non-metals are essential part of the body structure all living things. Human body is made up of about

elements. But about 96% of the mass of the human body is made up of just 4 elements *i.e.*, oxygen 65%, carbon 18%, hydrogen 10% and nitrogen 3%. Similarly, plant bodies are made up of cellulose, which is composed of carbon, hydrogen and oxygen.

2. Life owes to non-metals as without O_2 and CO_2 (essential gases for respiration of animals and plants, respectively), life would not have been possible. In fact, these gases are essential for the existence of life.

(vii) Write two chemical properties of halogens.

Ans Following are the two chemical properties of halogens:

1. Most of the halogens are non-metals. Thus they usually do not react with water.
2. They do not react with dilute acids because non-metals are itself electron acceptors.

(viii) Write two uses of gold.

Ans **Uses of gold:**

1. Because of its inertness in atmosphere, gold is an ornamental metal as well as used in making coins.
2. Gold is too soft to be used as such. It is always alloyed with copper, silver or some other metal.

(Part-II)

NOTE: Attempt any TWO (2) questions.

Q.5.(a) Write five branches of Chemistry. (5)

Ans Following are five of the branches of Chemistry:

1. Physical Chemistry:

Physical Chemistry is defined as "the branch of chemistry that deals with the relationship between the composition and physical properties of matter along with the changes in them."

The properties such as structure of atoms or formation of molecules, behavior of gases, liquids and

solids and the study of the effect of temperature or radiation on matter, all are studied under this branch.

2. Organic Chemistry:

Organic Chemistry is the study of covalent compounds of carbon and hydrogen (hydrocarbons) and their derivatives.

Organic compounds occur naturally and are also synthesized in the laboratories. Organic chemists determine the structure and properties of these naturally occurring as well as synthesized compounds. Scope of this branch covers petroleum, petrochemicals and pharmaceutical industries.

3. Inorganic Chemistry:

Inorganic chemistry "deals with the study of all elements and their compounds except those of compounds of carbon and hydrogen (hydrocarbons) and their derivatives."

It has applications in every aspect of the chemical industry such as glass, cement, ceramics and metallurgy (extraction of metals from ores).

4. Biochemistry:

It is "the branch of chemistry in which we study the structure, composition, and chemical reactions of substances found in living organisms."

It covers all chemical processes taking place in living organisms, such as synthesis and metabolism of biomolecules like carbohydrates, proteins and fats. Biochemistry emerged as a separate discipline when scientists began to study how living things obtain energy from food or how the fundamental biological changes occur during a disease. Examples of applications of biochemistry are in the fields of medicine, food science, agriculture, etc.

5. Industrial Chemistry:

The "branch of chemistry that deals with the manufacturing of chemical compounds on commercial scale, is called industrial chemistry."

It deals with the manufacturing of basic chemicals such as oxygen, chlorine, ammonia, caustic soda, nitric acid and sulphuric acid. These chemicals provide the raw materials for many other industries such as fertilizers, soap, textiles, agricultural products, paints, paper, etc.

(b) Give four differences between Rutherford's and Bohr's Atomic Theory. (4)

Ans Differences between Rutherford's and Bohr's atomic theory:

Rutherford's atomic theory	Bohr's atomic theory
(i) It was based on classical theory.	(i) It was based on quantum theory.
(ii) The electrons revolve around the nucleus.	(ii) The electrons revolve around the nucleus in orbits of fixed energy.
(iii) No idea about orbits was introduced.	(iii) The orbits have angular momentum.
(iv) The atoms should produce continuous spectrum.	(iv) The atoms should produce line spectrum.

Q.6.(a) Write any five properties of metals. (5)

Ans Following are the five properties of metals:

1. Almost all metals are solids (except mercury).
2. They have high melting and boiling points (except alkali metals).
3. They possess metallic luster and can be polished.
4. They are malleable (can be hammered into sheets), ductile (can be drawn into wires) and give off a tone when hit.
5. They are good conductor of heat and electricity.

(b) Define and verify Boyle's law with an example. (4)

Ans In 1662, Robert Boyle studied the relationship between the volume and pressure of a gas at constant

temperature. He observed that volume of a given mass of a gas is inversely proportional to its pressure provided the temperature remains constant.

According to this law, the volume (V) of a given mass of a gas decreases with the increase of pressure (P) and vice versa. Mathematically, it can be written as:

$$\text{Volume} \propto \frac{1}{\text{Pressure}} \quad \text{or} \quad V \propto \frac{1}{P}$$

$$\text{Or} \quad V = \frac{k}{P} \quad \text{or} \quad VP = k = \text{constant}$$

where 'k' is proportionality constant and the value of k is same for the same amount of a given gas. Therefore, Boyle's law can be stated as

"The product of pressure and volume of a fixed mass of a gas is constant at a constant temperature."

If $P_1V_1 = k$ Then $P_2V_2 = k$

where P_1 = initial pressure P_2 = final pressure

V_1 = initial volume V_2 = final volume

As both equations have same constant, therefore their variables are also equal to each other.

$$\therefore \quad P_1V_1 = P_2V_2$$

This equation establishes the relationship between pressure and volume of the gas.

Experimental Verification of Boyle's law:

The relationship between volume and pressure can be verified experimentally by the following series of experiments. Let us take some mass of a gas in a cylinder having a movable piston and observe the effect of increase of pressure on its volume. The phenomenon is represented in the following figure. When the pressure of 2 atmosphere (atm) is applied, the volume of the gas reads as 1 dm^3. When pressure is increased equivalent to 4 atm the volume of the gas reduces to 0.5 dm^3. Again when pressure is increased three times *i.e.*, 6 atm, the volume reduces to 0.33 dm^3. Similarly, when pressure

increased up to 8 atm on the piston, volume of the gas decreases to 0.25 dm^3.

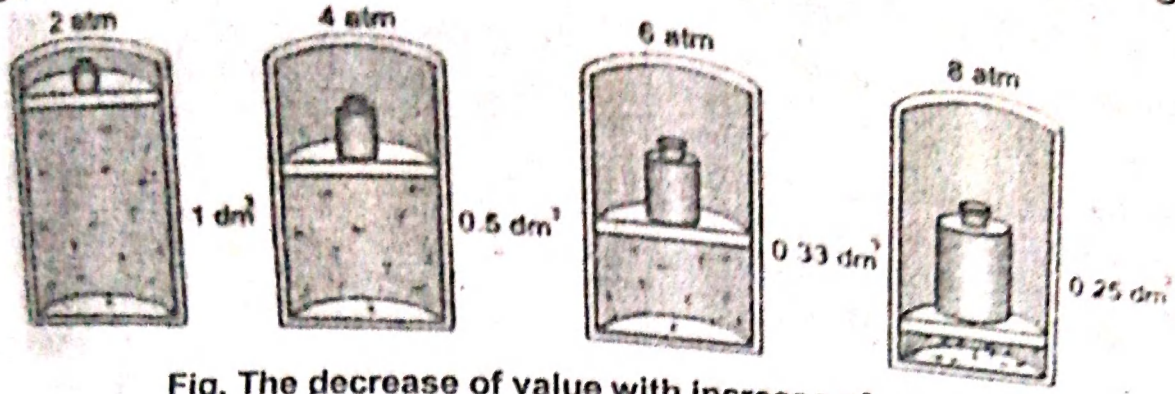

Fig. The decrease of value with increase of pressure.

When we calculate the product of volume and pressure for this experiment, the product of all these experiments is constant, *i.e.*, 2 atm dm^3. It proves the Boyle's law

$$P_1V_1 = 2 \text{ atm} \times 1 \text{ dm}^3 = 2 \text{ atm dm}^3$$
$$P_2V_2 = 4 \text{ atm} \times 0.5 \text{ dm}^3 = 2 \text{ atm dm}^3$$
$$P_3V_3 = 6 \text{ atm} \times 0.33 \text{ dm}^3 = 2 \text{ atm dm}^3$$
$$P_4V_4 = 8 \text{ atm} \times 0.25 \text{ dm}^3 = 2 \text{ atm dm}^3$$

Q.7.(a) What is solubility? Explain general principle of solubility. (5)

Ans Solubility:

Solubility is defined as "the number of grams of the solute dissolved in 100 g of a solvent to prepare a saturated solution at a particular temperature." The concentration of a saturated solution is referred to as solubility of the solute in a given solvent.

The general principle of solubility is (like dissolves like):

(i) The ionic and polar substances are soluble in polar solvents. Ionic solids and polar covalent compounds are soluble in water *e.g.*, KCl, Na_2CO_3, $CuSO_4$, sugar, and alcohol are all soluble in water.

(ii) Non-polar substances are not soluble in polar solvents. Non-polar covalent compounds are not

soluble in water such as ether, benzene, and petrol are insoluble in water.

(iii) Non-polar covalent substances are soluble in non-polar solvents (mostly organic solvents). Grease, paints, naphthalene are soluble in ether or carbon tetrachloride etc.

(b) Write down a note on electrolytic refining of copper. (4)

Ans Electrolytic refining of copper:

Impure copper is refined by electrolytic method in electrolytic cell. Impure copper acts as anode and a pure copper plate acts as a cathode as shown in the fig.:

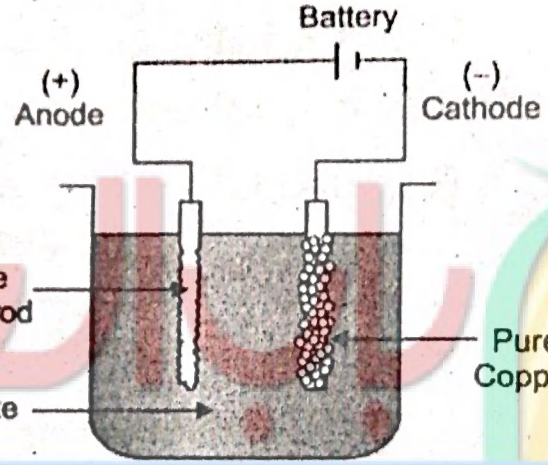

Fig. Refining of copper in an electrolytic cell.

Copper sulphate solution is used as an electrolyte. Oxidation reaction takes place at the anode. Copper atoms from impure copper lose electrons to the anode and dissolve in solution as copper ions.

$$Cu \longrightarrow Cu^{+2}_{(aq)} + 2e^-$$

Reduction reaction takes place at the cathode. The copper ions present in the solution are attracted to the cathode. They gain electrons from the cathode and become neutral and deposit on the cathode.

$$Cu^{+2}_{(aq)} + 2e^- \longrightarrow Cu_{(s)}$$

As a result, purified copper atoms are deposited on the cathode.